

IoT for Smart Car using Raspberry PI

Leelavathi T C¹, Dr. Shivaleelavathi B G², Shubha B³

*Dept. of Electronics and Communication, JSSATE
Bengaluru, India*

¹leelarj@gmail.com

²shivaleelavathi@yahoo.com

³Sriniketana@yahoo.co.in

Abstract - Due to increasing usage of IoT in automotive Embedded Systems, Smart Car application has gained enormous attention among the users. It's Difficult to trace missing vehicles in metropolitan cities or any theft activities when the Owner is not around the vehicle. This paper provides an overview of a method used for image capturing and location tracking followed to trace the missing vehicle or malicious activity in the vehicle.

Key Words: Android, Eclipse, GPS, Vehicle Tracking, PIR Sensors.



Fig-1: Connectivity across the Devices using IoT

1. INTRODUCTION

Internet of thing (IoT) is an advanced technology which helps devices to stay connected in the current generation. Each and every smart device can communicate with each other with the help of Network. Internet is used everywhere from small mobiles till high end data servers. There are billions of devices which can be accessed or connected using IoT. Security plays an important role in today's emerging technology. Each and every device can sync hand in hand from Bio-Medical to Automobiles. They can be paired together and exchange data across, or remote login to make life simpler as shown in Fig-1. This paper presents a combined effort to bring the Automotive & Android System together to serve the Purpose of tracking. A smart phone has over-ruled almost many devices together and now we can use the same for the purpose of Centre locking the Vehicle & Trace them if missing. The Device shall be Adverse enough to Trace the GPS location using (GPS, GLONASS) and predict the Longitude and Latitude of the Vehicle. This Data can be drawn on Maps to identify the Physical Location of the Vehicle [1].

2. LITERATURE SURVEY

A Tracking and Management system has been field of interest across the researchers. El-Medany, W.; Al-Omary et al designed a low cost vehicle tracking system with GM862 Cellular Quad band, a monitoring system was designed using SQL and ASP.net to trace the vehicle on the Maps. The paper provided the information regarding the Speed & Mileage of the Vehicle.

Le-Tien, T.; Vu Phung designed a system using GPS and Mobile Communication to route the vehicle over a larger outdoor network. The Compass-YAS52 & Accelerator-KXSC 72050 was used to trace the moving direction of the vehicle. Finally the vehicle location is trace over the Google Map for Detection.

use abbreviations in the title or heads unless they are unavoidable.

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3. OBJECTIVE

The main objective of the project is to deploy the IoT concept in the Car's to secure them from theft. Hence, we have come up with an idea to design tracking systems for the cars using IoT & motion sensing. Though the cars are equipped with Centre Locking systems, it's better to safe guard them with few sensors like Door sensors, Motion detection, GPS etc. which help us in identifying the status of the vehicle.

Smart Car App is used as a wireless centre locking system for the car. Any Mobile with Android OS can install this app and Login credentials are required to use. It can be used to lock/unlock the device. It's supported with Voice Commands to indicate the user regarding the Theft or any malicious activity in the Car. WiFi Dongle is used for Internet access. Once the user locks the car, the Tracking system is enabled to sense any Human motion detection or Door Sensors actuation. The Driver is notified through the APP that the vehicle has been stolen and the driver can activate the Tracking system which will enable the camera and start tracing the GPS location. The user can select whether he needs the Internal or External Image captured and saved over the device. Details regarding the Location and Image captured through PI camera are sent over Internet to the Users Mail ID. The GPS Locations in the Mail can be used to trace the vehicle over any Google Map software.

4. IMPLEMENTATION

This project is designed using a Raspberry PI single board computer used for embedded application. The Interfacing components used are PI camera, GSM & GPS Modem, Door Sensors, Proximity Sensors, Wi-Fi Dongle as shown in Fig-2. USB mouse and key board can be used for user-friendly usage of the Board. The 32 bit ARM controller on the Raspberry Device supports the Functionality as the CPU Core [2].

The Linux OS is used as the Default operating system responsible for handling the tasks and peripheral on chip components. Python scripting is used for the programming the device and Functionalities. During Power on Reset, the Device Initializations are completed and waits for the Centre Locking command to the car through the Smart Phone. The Locking is handled through a GSM Modem's SMS communication. The Door Lock sensors get actuated during the unauthorized opening of the door and Proximity sensors detect the human entry/motion inside the vehicle.

The Driver is notified through the APP that the vehicle has been stolen/mishandled and the driver can activate the Tracking system which will enable the camera and start tracing the GPS location. The user can select whether he needs the Internal or External Image captured and saved over the device. This can be done by rotating the camera behind the rear view mirror of the CAR. The Mailing System utilizes the Hotspot Connection and Populates a mail to the users mail ID or the CIS (Centralized Image Server) mail ID stored in the Vehicles Interface at specified periodic interval.

GSM Modem is interfaced using a Serial communication UART to Send and Receive the SMS over the Air. Sim 900 Tri-band GSM is used with a SIM card for identification; AT Commands are used for SMS Reception and Transmission.



Fig-2: GPS Data Reception and Data over IoT

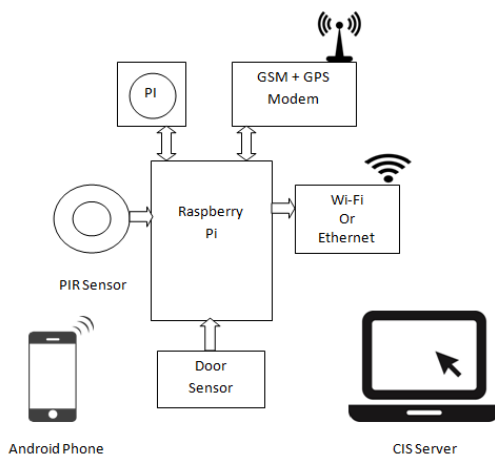


Fig-1: Block Diagram of Smart Car Tracking System

Android Application is designed using eclipse software to support the locking/unlocking feature using SMS threading technique. This app can be installed on any Latest Android Smart phones. The user has to login using the authenticated username and password to access the application. Application is designed to generate Voice commands to intimate user regarding the activity on the vehicle by detecting the Received SMS.

GPS Modem Questar G702-001UB compact all-in-one is used for tracking [3]. The Modem continuously received the signal from the satellites in View and provides accurate positioning data; the modem is ported to the Device using a Renesas processor to avoid overflowing of continuous data frames. Hence, both GSM and GPS are ported onto Single Serial Port of the Device. Data selection is done through a Switching Relay [4].

5. RESULT

The Smart Car Android App's snapshot has been designed as shown in the Fig-4. Application uses the Buttons for Locking/Unlocking the centre locking system of the vehicle [5]. The Track button is used to trace the vehicle. Discard button if door mishandled by user un-intentionally.

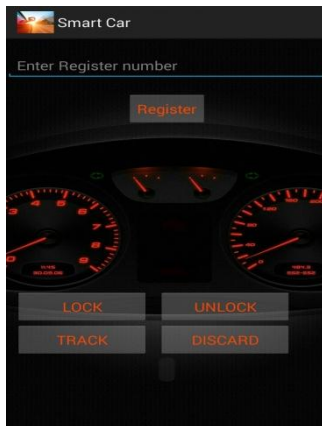


Fig- 3: Smart Car Android Application

The Result of the Smart Car based Tracking system is as shown in the Fig-5. The Copy of the Mail sent from the Raspberry PI board is received over a CIS mail ID is captured and snapshot of the Mail is affixed below.

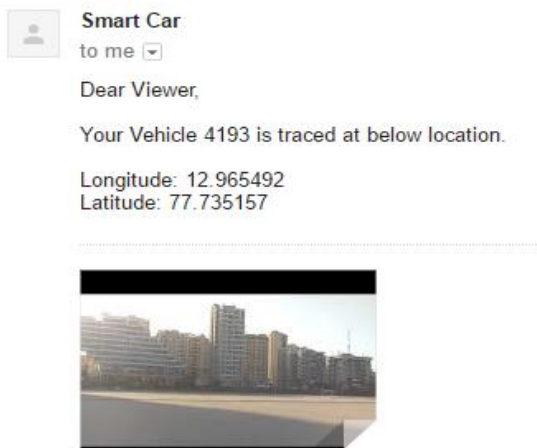


Fig-4: Mail copy received by CIS Server

The Longitudes and Latitudes points captured by the GPS are sent over the mail. The GPS point can be applied to the Google map to trace the exact location of the Vehicle. The Snapshot of the map trace is affixed as shown in the Fig-6 [7][8].

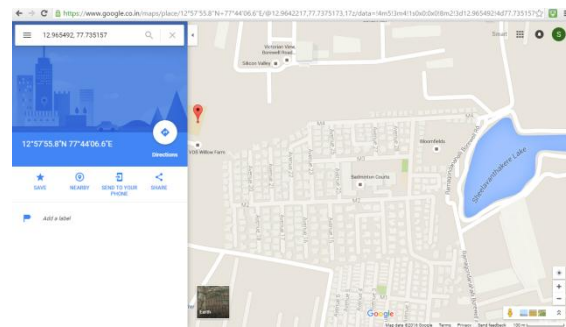


Fig-5: GPS Location Traced on Google maps

6. CONCLUSION & FUTURE SCOPE

In this paper we have proposed a Smart Car based application which can secure the car from theft and track the Missing Vehicles. The Sensors like PIR and Door Sensors will intimate the user regarding the un-authorized access or theft of the car. The Android Application can initiate the tracking facility which will mail the Image of the interior/exterior environment of the car as well as its GPS location to the CIS. The Application is capable of generating the voice based alert to the user. In Future the concept can be enhance to immobilize to vehicle, trace over mobile and map the location of vehicle. The Wi-Fi based hotspot can be replaced by the mobile internet from the service provider to maximise the network range.

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